

**CLAIMS**

What is claimed:

- 1           1.       A spectral correlator, comprising:  
2                   a specimen;  
3                   an optical device configured to collect light from the specimen and to  
4           optically determine a similarity of a received first spectra of the light collected  
5           from the first spectra and a second known spectra.
  
- 1           2.       The spectral correlator of claim 1, wherein the optical device is further  
2           configured to output a signal indicative of the similarity.
  
- 1           3.       The spectral correlator of claim 2, further comprising a detection  
2           device configured to sense the similarity signal and determine, based upon the  
3           similarity signal, whether a substance, represented by the second known  
4           spectra, is present in the specimen.
  
- 1           4.       The spectral correlator of claim 3, wherein the optical device comprises  
2           a first lens configured to perform a Fourier transform on the received first  
3           spectra.
  
- 1           5.       The spectral correlator of claim 4, further comprising a spatial filter  
2           containing the Fourier transform of the second known spectra.

1           6.       The spectral correlator of claim 5, wherein the first lens transmits a  
2           signal indicative of the Fourier transform of the received first spectra to the  
3           spatial filter.

1           7.       The spectral correlator of claim 6, further comprising a second lens  
2           configured to receive a second signal from the spatial filter and transmit a  
3           signal indicative of the similarity of the received first spectra and the known  
4           spectra onto the detection device.

1           8.       The spectral correlator of claim 7, wherein the specimen is in direct  
2           proximity to the optical device.

1           9.       The spectral correlator of claim 7, wherein the specimen is remote from  
2           the optical device.

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2           10.     The spectral correlator of claim 9, wherein a variation with time of the  
3           similarity signal is a representation of the variation as a function of distance of a  
4           concentration of the specimen indicated by the second known spectra.

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6           11.     The spectral correlator of claim 4, further comprising a spatial filter,  
7           wherein the spatial filter contains a representation of the second known  
8           spectra.

1           12.     The spectral correlator of claim 11, wherein the first lens transmits a  
2           signal indicative of the Fourier transform of the received first spectra to the  
3           spatial filter.

1           13.     The spectral correlator of claim 12, wherein the optical device further  
2           comprises a second lens configured to receive a second signal from the spatial  
3           filter indicative of the first signal and the representation of the known spectra.

1           14.     The spectral correlator of claim 13, wherein the second lens is  
2           configured to focus the received second signal and transmit a signal indicative  
3           of the similarity of the received first spectra and the known spectra onto a  
4           detection device.

1           15.     The spectral correlator of claim 14, wherein the specimen is in direct  
2           proximity to the correlator.

1           16.     The spectral correlator of claim 14, wherein the specimen is remote  
2           from the optical device.

1           17.     The spectral correlator of claim 16, wherein the variation with time of  
2           the similarity signal is a representation of the variation as a function of distance  
3           of the concentration of the specimen indicated by the second known spectra.

1           18.     A spectral correlator, comprising:  
2                     a specimen;  
3                     an illuminating device configured to illuminate the specimen; and  
4                     an optical device configured to optically determine the similarity of a  
5     received first spectra resulting from the illumination of the specimen and a  
6     second known spectra.

1           19.     The spectral correlator of claim 18, wherein the optical device is  
2     further configured to output a signal indicative of the similarity.

1           20.     The spectral correlator of claim 19, further comprising a detection  
2     device configured to sense similarity signal and determine, based upon the  
3     similarity signal, whether a substance, represented by the second known  
4     spectra, is present in the specimen.

1           21.     The spectral correlator of claim 20, wherein the optical device  
2     comprises a first lens configured to perform a Fourier transform on the  
3     received first spectra.

1           22.     The spectral correlator of claim 21, further comprising a spatial filter,  
2     wherein the spatial filter contains the Fourier transform of the second known  
3     spectra.

1           23.     The spectral correlator of claim 22, wherein the first lens transmits a  
2           signal indicative of the Fourier transform of the received first spectra to the  
3           spatial filter.

1           24.     The spectral correlator of claim 23, wherein the optical device further  
2           comprises a second lens configured to receive a second signal from the spatial  
3           filter indicative of the first signal and the Fourier transform of the known  
4           spectra.

1           25.     The spectral correlator of claim 24, wherein the second lens is  
2           configured to focus the received second signal and transmit a signal indicative  
3           of the similarity of the received first spectra and the known spectra onto a  
4           detection device.

1           26.     A spectral correlator of claim 25, wherein the received first spectra is a  
2           Raman spectra resulting from the illuminating device illuminating the  
3           specimen and the second spectra is a known Raman spectra.

1           27.     A spectral correlator of claim 26, wherein the received first spectra is a  
2           Raman spectra resulting from the illuminating device illuminating the  
3           specimen and the second spectra is a known Raman spectra.

1           28.     The spectral correlator of claim 21, wherein the spatial filter contains a  
2           representation of the second known spectra.

1        29.     The spectral correlator of claim 28, wherein the first lens transmits a  
2        signal indicative of the Fourier transform of the received first spectra to the  
3        spatial filter.

1        30.     The spectral correlator of claim 29, wherein the optical device further  
2        comprises a second lens configured to receive a second signal from the spatial  
3        filter indicative of the first signal and the representation of the known spectra.

1        31.     The spectral correlator of claim 30, wherein the second lens is  
2        configured to focus the received second signal and transmit a signal indicative  
3        of the similarity of the received first spectra and the known spectra onto a  
4        detection device.

1        32.     A spectral correlator of claim 31, wherein the received first spectra is a  
2        Raman spectra resulting from the illuminating device illuminating the  
3        specimen and the second spectra is a known Raman spectra.

1        33.     The spectral correlator of claim 32, wherein the variation with time of  
2        the similarity signal is a representation of the variation as a function of  
3        distance of the concentration of the specimen indicated by the second known  
4        spectra.

1           34.    A spectral correlator, comprising:  
2                   a specimen;  
3                   means for receiving light reflected off and/or emitted by the specimen;  
4           and  
5                   means for optically correlating the light received to determine the  
6           similarity of the spectra of the received light from the specimen and a second  
7           known spectra.

1           35.    A spectral correlation method, comprising the steps of:  
2                   receiving a first spectra corresponding to a specimen;  
3                   performing a first Fourier transform on the first spectra via a first lens  
4           to obtain a transformed first spectra;  
5                   multiplying the transformed first spectra with a representation of a  
6           known spectra to obtain a similarity signal; and  
7                   focusing, via a second lens, the similarity signal on a detector.

1           36.    The method of claim 35, wherein the representation of the first spectra  
2           is a Fourier transform of the known spectra.

1           37.    The method of claim 35, wherein the performing step, the multiplying  
2           step and the focusing step are optically performed via an optical device.

1           38.    The method of claim 35, wherein the specimen is remotely located  
2           from the optical device.

1        39.     The method of claim 35, wherein the specimen is housed proximate to  
2        the optical device.

1        40.     The method of claim 35, wherein the first spectra is a Raman spectra,  
2        and the known spectra is a Raman spectra.

1        41.     The method of claim 40, wherein a variation with time of the similarity  
2        signal is a representation of the variation as a function of distance of the  
3        concentration of the specimen indicated by the known spectra.

1        42.     A spectral correlation method, comprising the steps of:  
2             receiving a first spectra corresponding to a specimen;  
3             separating the first spectra into its component colors;  
4             multiplying the separated first spectra with a representation of a known  
5        second spectra to obtain a similarity signal; and  
6             detecting the similarity signal.